New natural preservation ingredients: Challenges and opportunities

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Introduction: Meat processing facilities are specific niches, which are harboring persistent, meat-adapted lactic acid bacteria (LAB, which are often found in spoiled cooked meat products. The resilience and meat adaptation traits of some lactic acid bacteria species are related to their cold tolerance, resistance towards some sanitizers and preservatives, increased salt tolerance and utilization of meat-specific nutrient sources as part of their metabolism. Here we aimed to identify new natural preservation solutions, which would have a superior performance to the organic acids in terms of controlling the growth of resistant LAB isolated from spoiled cooked meat.

Materials and methods: More than one hundred individual and combined plant extracts containing various active molecules (e.g. phenols, terpenes, triterpene glycosides, flavanones, glycerides) and natural ferments (containing various organic acids) were tested in a cooked chicken meat model. A cocktail of six strains belonging to different Leuconostoc sp. and Lactobacillus sp. was used to artificially contaminate (3 Log CFU/g) the cooked meat samples, which were vacuum packed and refrigerated. Results were expressed as time to 5 Log CFU/g outgrowth (TTG5, calculated by using the DMfit program, which uses Baranyi and Roberts model to fit curves with growth data by linear and nonlinear regression), which represents the number of days needed by the LAB strains cocktail to reach the spoilage threshold of ≥7Log CFU/g.

Results: Untreated control samples had an average TTG5 of 6.4 days. The best performance resulted from combinations of plant extract and rich organic acid ferments (TTG5 of 19-35 days) or combinations of different organic acids ferments only (average TTG5 of 14.6 days). In spite of the high performance of these combinations their sensory impact was significant, which makes their practical application very challenging. This was observed following an, in house, sensory evaluation of most effective combinations where ferments containing organic acids have shown a mild impact on the overall flavor when compared to an untreated reference sample. When compared individually, the ferments containing organic acids had a significantly superior efficacy to most of the plant extracts with respect to the growth inhibition of the LAB cocktail. In addition, the sensory evaluation revealed that most plant extracts have a more severe flavor impact as compared to the organic acids ferments.

Conclusions: Several aspects hampering the development of new effective natural solutions are related to the interaction of active molecules with the meat environment, the severe flavor impact and the regulatory limitations in some regions and/or countries. The results reported here have shown that the oragnic acids have a significantly better performance, in terms of controlling the outgrowth of resistant LAB strains, as compared to most of the natural plant extracts

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